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Comparing Different Audio Compression Techniques

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Abstract

Due to the wide range use of audio and speech technology. the need of important and efficient data storage must be important. In this paper tries to summarize the basic audio compression techniques and allowing to chose the right compression technique from the popular and widely used audio compression techniques. So there are many technology which compares audio compression so here we use some popular technology which are used in wide range. Audio compression is one of the important part of the digital audio processing in order to reduce the data transmission and data storage cost. This paper covers the two broad categories of the audio compression such as lossy and lossless audio compression and there standards used by then such as MP3/MP4/FLAC/M4A etc.

Keywords : Compression, Audio Compression, Lossy Compression, Lossless Compression, Huffman Coding.

1. Introduction

After the coming of the WEB2.0, Social media cloud technologies and other various technologies. there is highly increase the data in large amount.
The devices are getting more capability to process and save data in higher and best quality. This results in the increase in the storage capabilities and also their cost. Data compression helps to utilize more space. System Graphic content which mainly includes the audio and video however in digital world we still us mp3 audio format. infact flac is much better than mp3 because it is considered good audio quality format so in digital world whereas the series of audios thus storing voice of audios and videos the voice that we hear day today life is a analog waveform[1]. that waves are getting airpressure around us. which we hear by using of eardrum. higher audio format which are higher in the size are difficult and difficult to transfer over the internet to other users around the globe. to counter these problems many Audio compression techniques are used and choosing the right audio compression technique is also essential while creating audio processing applications. There are many audio compression algorithms out there and they are divided into two broad categories one is lossy compression and other one is lossless compression.

2. Literature Review

Lossy Compression and Lossless Compression

Both lossy and lossless compression techniques has there own advantages and disadvantages in the real world application and both have wide range of compression algorithms available. In both the techniques in order to reduce the storage cost there

may be loss of some quality from the audio data which is given to the application[2].

2.1. Lossy Compression

The lossy compression is one of the widely used audio compression technique used for the compression of the audio data in order to reduce the storage cost. it is also known as irreversible compression. the lossy compression leads to the some how loss of quality from the audio and have to hold certain space to contain the necessary information. A well defined lossy compression algorithm or technology have the capability or can be used to find the perfect balance between the audio quality and the storage cost[3]. In lossy compression there is also a phenomenon called the generation loss which is continues compression and decompression leads to loss of overall quality. Lossy compressed audios or data require less bandwidth to transfer over the devices or internet and widely used in the technologies such as streaming services such as amazon prime, Netflix etc. and internet VoIP or internet telephony. There are many lossy compression techniques some wide used are as follows :

1. **Modified Discrete cosine transform (MDCT)**
   1.1. Mp3
   1.2. Ac-3
2. **Cartesian Perceptual Compression**
3. **Transform Coding Compression**
4. **Wavelet Compression**

2.1.1. Modified Discrete Cosine Transform

The Modified discrete cosine transform is enhanced from discrete cosine transform. It is one of the popular techniques used for the data compression. it is used not only for the audio data but can be also used for the other types of data such as the videos, images and other digital media formats. It was first proposed by the Nasir Ahmed in 1972 while he was working at the Kansas state university and widely used in the applications such as the digital signal processing, communication devices etc. In the discrete cosine transform the sequence of the data points are represented in the form of the cosine functions which are oscillating at different frequencies and this technique have the capability to achieve the compression ratios from 8:1 to 14:1 and upto 100:1 for acceptable quality of the data its biggest advantage is to retain acceptable quality and much more smaller size and standards such as FLAC provide faster processing and provide large support base of devices. Every technique have some advantages and disadvantages of there own so that of discrete cosine transform it do not support the multi format and lead to some data loss after the compression[3][4].

2.1.2. Cartesian Perceptual Compression

Now a days increase in the amount of data not only in the form of audio, video and images but also from documents which may be in any format documents corporate documents or even documents like this which contains information in multiple formats. single document can have both text and image or audios in it so we have to store and transmit the data over internet, fax machines, mobiles require some sort of technique which is used in compression. The cartesian perceptual compression is one of the popularly used compression technique for the compression of black and white images, documents for the archival scans in order to reduce the storage cost. It was developed and owned by a private organization known as Cartesian Inc which is located at Cambridge, Massachusetts. This technique is further divided into three more groups of compression methods they are as follows:

- **GROUP 3 1D**
- **GROUP 3 2D**
- **GROUP 4**

2.1.3. Transform Coding Compression

The Transform Coding compression is a lossy compression technique it is used for data compression used for digital images, digital audio.

which is used in the compression of audio and image data. Basically it will do lowering the bandwidth of data and the output is encoded the best transform coding form in audio data is perceptual coding. It transform the raw data into a domain that reflects the information content by summarize its amplitude levels over time. The perceptual coding compression divides the audios into segments based on the frequency, wavelength, edges, frequency etc. and use a dictionary to lookup and called it the perceptual encoding and then the segments are then encoded thus it is very efficient possible way to encode the natural audios containing the textures. Being a lossy compression technique the quality of audios gets low as compare to the original one because of loss of data during the compression.

2.1.4. Wavelet Compression

Wavelet compression is a type of discrete cosine transformation data compression technique it reduce the size of data and improving its quality by using to eliminate its noise and linear compressed in

which it uses a wavelet instead of the DCT block in the algorithm. It comes in both types lossy and lossless compression. The wavelet compression is widely used for the transient data. The wavelet transformation has slight advantage over the fourier transformation. There are a large amount practical implementations of the wavelet compression technique some of them are as follows.

- **Thresholding**
- **ECW**

2.2. Lossless Compression

The lossless compression is a type of compression technique in which the data which is regenerated cannot work without incomplete data or malfunction in the absence of accurate data. The lossless compression techniques can be used for wide range of data type such as audios, videos, images, text, documents etc[10]. by compressing the data and reduce the storage cost etc. In this compression the audio which is compressed using the lossless compression method can be recovered in original quality without losing out any detail and without adding any noise in the audio. There are many lossless compression techniques some of them as follows:

- **Adaptive Transform Acoustic Coding**
- **Entropy encoding**
- **DEFLATE**

2.2.1. Adaptive Transform Acoustic Coding

It is a technique which is used in audio compression algorithms Developed by Sony.MiniDisc. which was the first product of ATRAC in 1992. It allows relatively small disc which was the same running time as CD while storing audio information with minimal loss of audio quality. Improvements in Adaptive Transform Acoustic Coding is ATRAC3, ATRAC3plus both are hybrid subbands but several difference in terms of signals. Both used for audio compression.

2.2.2. Entropy encoding

The entropy encoding is a type of lossless data compression technique in which the algorithm which assigns unique prefix code to the input data of fixed length and the length of each codeword is directly proportional to the probability of the occurrence and taking the negative logarithm of the input data and replacing each input data with the formated codes in the output as compressed form of data and the entropy encoding can be used to large extent of data types and able to compress data at certain level and cannot compress more than that level of compression. There are two popular algorithms for the implementation of the entropy encoding.

- **Huffman Coding**
- **Arithmetic Coding**

2.2.3. DEFLATE

The DEFLATE is popular lossless data compression technique which is implemented with the help of two algorithms. one is **Huffman coding** and other one is **LZ77.** In this compression technique the data is compressed based on the combination of the encoded bytes[5][6] and matching string. It uses the properties of both of the algorithms to compress the data where LZ77 is used to compress the repeated

sequence of characters and then generating the Huffman code in order to compress the data some popular standards of the DEFLATE are:

- **FLAC**

3. Technology In Trends

Now a days MPEG technology is a wide range of efficient technology in the area of communication which is used day by day as audibility in the major medium used by the receiver in the communications.
The television network which is used MPEG-1,MPEG-2 and MPEG-DASH is widely used in audio technology in the current era of audio communication [1]. which enhance the balance and maintains the fidelity of audio signals. This is some grown technology which are used in audio compression techniques and efficient to us.

4. Conclusion

This paper compare basic audio compression or techniques and the standards which are used by that technique so there are two types of the compression techniques. which are widely used in data compression its hard to find it out which compression technique should be used. Data critical application such as graphical and digital audio where loss of any data is not ignorable. So that we can use lossless data compression techniques such as DEFLATE, Huffman coding etc. and where the small loss of data that are not noticeable and tolerable lossy compression technique such as wavelet compression and Modified discrete cosine transform can be used[1][2]. Thus an enhanced and properly implemented lossless compression is used over the lossy compression techniques.

5. Future Scope

The Future scope of audio compresiion technique is to compress reduces the dynamic ranges of your sound and audio recording. Lowdown the loudest part and make them a peacefull volume.
Theaudio compression technique can boost the overall sound of compressed signal the volume changes of a recording are now under more control[1]. It is also give us a choice to make a balance ratio where you determine how much compression you are applying in it.
So the audio compression technique is very usefull for future refrences.

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